

CLAIMS

1. A method of testing comprising:
disposing a first film of a first contact material on a substrate;
mounting the substrate on a chuck of an atomic force microscope;
disposing a second film of a second contact material on a rounded end piece of an arm of the atomic force microscope; and
measuring a characteristic related to the first film and the second film contacting using at least one measurement circuit to perform at least one measurement after the first film and the second film contact each other at a controlled force.
2. The method according to claim 1 wherein the characteristic is a contact resistance and the step of measuring measures the contact resistance between the first film and the second film.
3. The method according to claim 2 wherein, prior to the step of controlling is included the steps of:
electrically connecting the first film to a first lead of the measurement circuit; and
electrically connecting the second film to a second lead of the measurement circuit.
4. The method of claim 2 wherein the step of measuring the contact resistance performs a plurality of contact resistance measurements at a corresponding plurality of forces between the first film and second film.

5. The method of claim 2 wherein the step of measuring occurs when the step of controlling causes the first film and the second film to contact each other using a controlled force lower than 1 mN.

6. The method of claim 5 wherein the controlled force is between 10 μ N and 100 μ N.

7. The method of claim 1 wherein each of the first film and the second film has a thickness not exceeding about ten microns.

8. The method of claim 1 wherein the characteristic is parasitic resistance and wherein the step of measuring performs a parasitic resistance measurement for the measurement circuit at a calibration force higher than the controlled force.

9. A method according to claim 1 wherein the characteristic is a current-dependent stiction force and the step of measuring performs a measurement of the current-dependent stiction force between the first film and the second film.

10. The method according to claim 9 wherein the step of measuring includes:

running a current through a contact interface between the first film and the second film while the contact between the first film and the second film at the controlled force is maintained; and

after running the current, measuring a stiction force between the first film and the second film by separating the first film and the second film at the contact interface.

11. The method of claim 9 wherein the step of measuring includes performing a plurality of stiction force measurements at a corresponding plurality of applied forces between the first film and second film.

12. The method of claim 9 wherein the step of measuring includes performing a plurality of stiction force measurements, each of the plurality of stiction force measurements including running one of a plurality of different currents through a contact interface and, after running each different current through the contact interface, measuring the stiction force between the first film and the second film by separating the first film and the second film at the contact interface.

13. The method of claim 10 wherein the current is higher than 5 μ A and lower than 100 μ A.

14. The method of claim 9 wherein the controlled force is lower than 1 mN.

15. The method of claim 14 wherein the controlled force is between 10 μ N and 100 μ N.

16. The method of claim 9 wherein each of the first film and the second film has a thickness not exceeding about one micron.

17. The method of claim 9 wherein the arm comprises an elongated member having a proximal end and a distal end, and a rounded piece mounted on the elongated member at the distal end wherein the second film attached to the rounded piece defines a contact surface with the first film.

18. The method of claim 17 wherein a radius of curvature of the rounded piece along the contact surface is higher than 10 μm and is lower than 100 μm .

19. A method according to claim 1 wherein a radius of curvature of the rounded piece along a contact surface between the first film and the second film is higher than 10 μm and lower than 100 μm .

20. The method according to claim 19 wherein the step of measuring the characteristic related to the first film and the second film contacting occurs when the first film and the second film contact with the controlled force not exceeding 10 μN .

21. The method according to claim 20 wherein the characteristic is a contact resistance value.

22. The method according to claim 19 wherein the characteristic is a current-dependent stiction force value and wherein the step of measuring the characteristic related to the first film and the second film contacting occurs after the first film and the second film contact with the controlled force and while the first film and the second film contact with a stiction measurement force not exceeding 1 mN.

23. The method of claim 22 wherein the step of measuring the current-dependent stiction force value is performed after passing a current higher than 5 μA and lower than 100 μA through a contact interface between the first film and the second film when the first film and the second film contact with the controlled force.